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Office of River Protection, State of Washington Department of Ecology
Tank Waste Retrieval Work Plan/Functions and Requirements Change Notice
(Per Hanford Federal Facility Agreement and Consent Order Section 9.3)

1. Document Title and Number: RPP-22393, Rev. 6A, 241-C-102, 241-C-104, 241-C-107, 241-C-108 and 241-C-112 Tanks Waste Retrieval Work Plan		
2. Minor Field Change: (Section 12.4 HFFACO Action Plan) ☐ Yes: (WRPS Signature Only – Attach signed form to Primary Document for record purposes) x No: Proceed to Box 3	**3.** Document Issue Date: 05/21/12 **4.** Document Modification Notice Date: 5/08/13	**5.** Notice Number: 2013-06
6. Do proposed changes require schedule changes? (Would this extend completion of retrieval beyond 12 months from date of initiation?) ☐ Yes x No	**7.** Do proposed changes include specific additions, deletions, or modification to scope and/or requirements which affect the overall intent of the plan? ☐ Yes x No	**8.** (Check only one box) ☐ Significant Modification (Check if the answer to question in either section 6 or 7 is "yes". Significant modifications require revision of the primary document.) Minor Modification x Requires modification of the document x Can be accomplished with Modification Notice.

9. Description and Justification of Change:

Change Description: A change is necessary to include updates that have been made in other TWRWPs. A full revision of RPP-22393, incorporating all approved modifications to revision 6A is planned.

Justifications:

- Pg viii—added trademark note
- Section 2.5, pg 2-13--clarified reference
- Section 3.1.3, pg 3-15—added requirement to provide basis and rationale for continued operation
- Section 3.8, pg 3-28--Updated IQRPE requirement reference.
- Section 4.1.2, pg 4-4 to 4.5– Deleted reference to outdated PNNL groundwater monitoring plan and reference and added current reference.
- Section 4.2, pg 4-6—Updated cross reference.
- Section 4.2.1.1, pg 4-11—Added new hydroprobe procedure reference.
- Section 5.0, pg 5-1--Updated air permit reference.
- Section 9—Updated references

See the attached redline strikeout pages.

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10. Impact of Change:

The changes make RPP-22393 consistent with other recently modified TWRWPs.

11. Additional Requirements and/or Provisions

Approvals

Washington River Protection Solutions, LLC.	Office of River Protection	State of Wash., Dept. of Ecology
		Jeff Lyon
☐ Provisional Approval[2] Date	☐ Provisional Approval[2] Date	☐ Provisional Approval[2] Date
☒ Final Approval Date 10/8/13	☒ Final Approval Date 10-8-2013	☒ Final Approval Date 10/15/13

Notes

1 - For use by Ecology to identify any additional information needed to make a decision regarding the request for modifications. In addition, Ecology will identify actions, if any, regarding the modification request that DOE may take pending Ecology's final decision

2 – Provisional approval allows DOE and it's contractors to take specific actions identified in section 11, prior to final approval of this modification.

LIST OF TERMS

Terms

High Pressure Water in the context of this document means any water supplied at a higher pressure than the raw water supply pressure.

Abbreviations and Acronyms

1C	bismuth phosphate first-cycle decontamination
ALARA	as low as reasonably achievable
BBI	best-basis inventory
CH2M HILL	CH2M HILL Hanford Group, Inc.
COPC	constituent of potential concern
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERSS	Extended Reach Sluicing System
HFFACO	*Hanford Federal Facility Agreement and Consent Order*
HI	hazard index
HIHTL	hose-in-hose transfer line
HRR™	high-resolution resistivity
IH	Industrial Hygiene
ILCR	incremental lifetime cancer risk
LDM™	leak detection and monitoring
ORP	Office of River Protection
PrHA	Process hazards analysis
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RMS	retrieval monitoring system
SST	single-shell tank
TBP	tributyl phosphate
TOC	tank operations contractor
UPR	unplanned release
WMA	waste management area
WRS	waste retrieval system

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™ Leak Detection and Monitoring (LDM) is a trademark of hydroGEOPHYSICS, Inc., Tucson, Arizona

estimates developed using the Hanford Defined Waste (HDW) Model (RPP-19822, *Hanford Defined Waste Model – Revision 5.0).*

- The above meets the requirement in Section 2.1.3 of Appendix I of the HFFACO that requires those contaminants accounting for at least 95% of the impact to groundwater risk be addressed.

- The BBI is the best available data; however, the Part A Permit provides a list of constituents that may or may not be present in the SSTs. To address this uncertainty, a post-retrieval sample will be taken of the residual waste for all constituents identified in the Ecology-approved sampling and analysis plan, pursuant to the requirements of that sampling and analysis plan.

There are currently no plans to perform additional characterization (e.g., sampling and analyses) of the waste in tank C-102, C-104, C-107, C-108, or C-112 to support waste retrieval and transfer. Sampling and analyses of the waste from each of the tanks will be performed at or near the end of waste retrieval activities in support of component closure activity actions. Sampling and analysis activities associated with component closure actions will be defined through the planned component closure data quality objectives process and described in the associated waste sampling and analysis plans yet to be developed and to be approved by Ecology.

Meeting the informational requirements for waste transfers meets the substantive requirements of WAC 173-303-300, "General Waste Analysis." Compliance with the following documents is required before initiating a waste transfer:

1. RPP-29002, *Double-Shell Tank Waste Analysis Plan.* SST transfers into the DSTs for any reason must meet the waste acceptance criteria presented in this plan. This plan is written pursuant to WAC 173-303-300(5) and U.S. Environmental Protection Agency (EPA) guidance document OSWER 9938.4-03, *Waste Analysis at Facilities That Generate, Treat, Store and Dispose of Hazardous Waste.*

2. Waste Stream Profile Sheet (RPP-29002~~, Attachment A~~). The sheet addresses the applicable sections of WAC 173-303-300; 40 CFR 761, "Polychlorinated Biphenyls (PCBs). Manufacturing, Processing, Distribution, Commerce, and Use Prohibitions"; 40 CFR 268, "Land Disposal Restrictions"; and WAC 173-303-140, and also requires a waste compatibility assessment pursuant to HNF-SD-WM-DQO-001, *Data Quality Objectives for Tank Farms Waste Compatibility Program*, to meet WAC 173-303-395(1).

2.5.1 Tank C-102 Operating History

The following information is taken from HNF-SD-WM-ER-651, *Preliminary Tank Characterization Report for Single-Shell Tank 241-C-102: Best-Basis Inventory.* The purpose of HNF-SD-WM-ER-651 is to summarize the information on the historical uses, current status, and sampling and analysis results of waste stored in tank C-102.

operations have been performed to enable development of a justifiable definition. Until an ERSS MARS-S limit of technology definition is developed the same value used for modified sluicing in RPP-50910 is applied to MARS-S retrieval operations.

There is no limit of technology definition for a chemical retrieval process. A limit of technology definition will not be developed until sufficient chemical heel retrieval operations have been performed to enable development of a justifiable definition. It is estimated that this will take 3 to 4 heel retrieval operations.

Appendix C, Part 1 of the Decree defines the limit of technology as follows:

> "The "limits of technology" means that the recovery rate of that retrieval technology for that tank is, or has become, limited to such an extent that it extends the retrieval duration to the point at which continued operation of the retrieval technology is not practicable, with consideration of practicability to include matters such as risk reduction, facilitating tank closures, costs, the potential for exacerbating leaks, worker safety, and the overall impact on the tank waste retrieval and treatment missions."

For MARS-S, data for retrieval performance measurement used to show the limits of technology have been met will be used after implementation of one or both low pressure sluicing and high pressure water operations (each technology will not be evaluated separately for its limit of technology).

Experience has shown that unexpected waste forms and tank conditions may be encountered and that equipment performance can degrade with time. The ORP will inform Ecology at least every 2 weeks, through normally scheduled meetings, about unexpected waste forms, behavior and tank conditions along with retrieval equipment performance changes that would impact overall retrieval rates and retrieval volume. If a normally scheduled meeting does not occur Ecology will initiate a meeting for this information exchange.

At these meetings, ORP will provide to Ecology the basis and rationale for continuing retrieval when it is suspected that waste form behavior, tank condition and/or equipment performance has diminished significantly or performance impacted the ability of the deployed equipment to operate in order to meet the waste residual goal of 360 ft^3.

Ecology is notified in the Tri-Party Agreement project manager's monthly meeting when the limits of technology have been reached. Status reports are continued until waste retrieval operations cease. An SST waste retrieval evaluation form and a retrieval report are then prepared and issued and in accordance with the Decree, Part IV, B. 5:

> "When DOE completes retrieval of waste from a tank covered by this Decree, DOE will submit to Ecology a written certification that DOE has completed retrieval of that tank. For purposes of this Consent Decree, "complete retrieval" means the retrieval of tank waste in accordance with Part 1 of Appendix C and with the retrieval technology/systems that were established by Part 1 of the TWRWP either by approval of Ecology or after dispute resolution by the Court under Section IX of the Decree."

a tank system in accordance with WAC-173-303-040, "Definitions." The waste tank system equipment is described in Section 3.1.1.

A written integrity assessment, reviewed and certified by an IQRPE, attesting that the transfer-related equipment and associated transfer lines are suitable for use during waste retrieval operations will be prepared in accordance with WAC 173-303-640(3), "Design and Installation of New Tank Systems or Components," and submitted to Ecology following completion of the design and field installation of the WRS. This includes verification that the subject equipment meets the requirements set forth in WAC 173-303-640(3) and WAC 173-303-640(4), "Containment and Detection of Releases." If additional systems or additional transfer line systems are used, each system will be evaluated by an IQRPE. The design provided to the IQRPE for review will include all new or existing transfer systems, structures or components, including secondary containment (e.g., central caisson if used) and leak detection equipment used for waste transfer lines.

The requirements for an IQRPE assessment and the permitting decision logic for new equipment or repairs/upgrades to equipment will be performed in compliance with TFC-ESHQ-ENV_PP-C-11, ~~*IQRPE*~~ *Independent Qualified Registered Professional Engineer Assessment Process* ~~(currently in draft) or successor document~~.

Risers were reviewed as part of the original SST System Integrity Assessment (RPP-10435). SST system components (e.g., risers, pits, etc.) that were identified as part of the SST system for the original Integrity Assessment are not part of the retrieval system (unless specifically identified as such) and do not require a separate or additional integrity assessment if the function of the equipment doesn't change from its original purpose (e.g., the original purpose of risers is to provide tank access) and changes to the component are not outside the original component design basis and specifications.

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4.1.2 Groundwater Monitoring

Identify the number and location of groundwater monitoring wells associated with the Waste Management Areas (WMA). Summarize current groundwater monitoring activities.

Groundwater monitoring at WMA C was begun in 1990 using four RCRA groundwater monitoring wells constructed in 1989 (299-E27-12, 299-27-13, 299-E27-14, and 299-E27-15). ~~The groundwater beneath the C tank farm has been monitored since 2001 in accordance with the RCRA groundwater monitoring plan established in 2001 (PNNL-13024, *RCRA Groundwater Monitoring Plan for Single-Shell Tank Waste Management Area C at the Hanford Site*). Figure 4-2 provides a plan view of the C tank farm and the surrounding RCRA groundwater monitoring wells. There are nine groundwater monitoring wells surrounding the C tank farm (four new wells were constructed in 2003). Since June 2002, groundwater sampling for the groundwater wells 299-E-27-7, 299-E-27-12, 299-E-27-13, 299-E-27-14, and 299-E-27-15 has been performed on a quarterly basis (PNNL-13024, ICN-1). Since December 2003, new groundwater monitoring wells 299-E-27-4, 299-E-27-21, 299-E-27-22, and 299-E-27-23 have also been sampled on a quarterly basis.~~ Additional monitoring wells have been added since 1989. A current list of the WMA C groundwater wells can be found in DOE/RL-2009-77. The wells are sampled quarterly to meet prior agreements made with Ecology. Quarterly samples are analyzed at a minimum for anions, cyanide, inductively coupled plasma metals, gross beta, ^{99}Tc, and total uranium, and a low-level gamma scan is performed. Sampling is conducted in accordance with DOE/RL-2009-77 and DOE/RL-2001-49.

The quarterly groundwater monitoring that is currently performed is adequate for the purpose of supplementary data collection during waste retrieval. Ecology is provided quarterly groundwater monitoring sample results in the quarterly and annual groundwater monitoring reports. These reports were previously issued by Pacific Northwest National Laboratory (e.g., results from the groundwater monitoring at the C tank farm for the third quarter of 2006 are reported in PNNL-16349, *Quarterly RCRA Groundwater Monitoring Data for Period July through September 2006*), in 2007 they started being issued by Fluor Hanford.

If a leak is detected during retrieval, groundwater monitoring frequency will be reevaluated in accordance with the regulatory requirements in WAC 173-303, "Dangerous Waste Regulations."

4.1.2.1 Use of Groundwater Monitoring for Retrieval Process Control.

(1) Evaluate the use of appropriately located existing groundwater monitoring wells for retrieval process control.

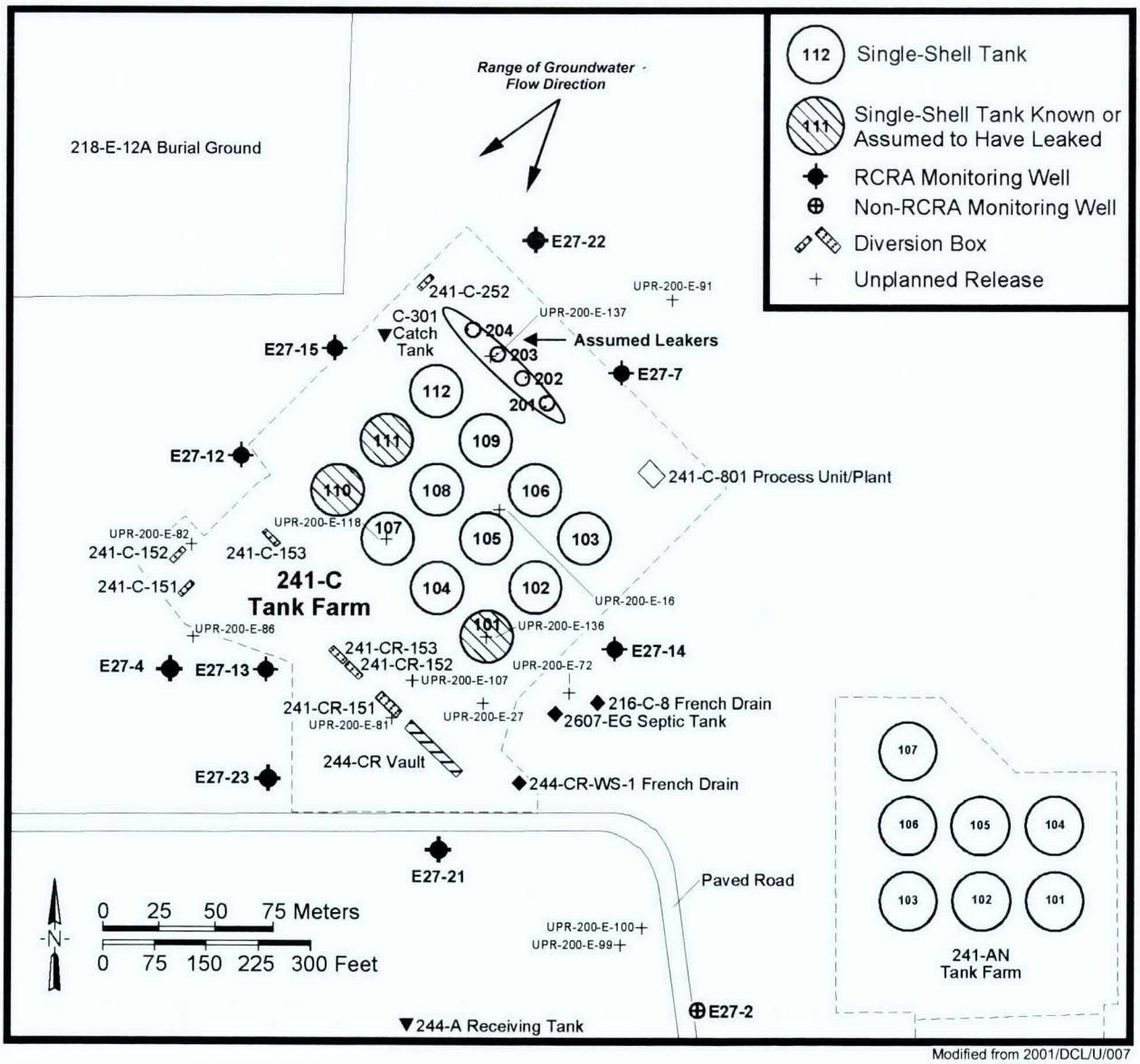
Based on the limitations of flow transport calculations and the time required for a retrieval leak to show up in groundwater samples, groundwater monitoring data will not be used for retrieval process control, but is available, for background reference information only, through the site groundwater monitoring program.

4.1.2.2 Groundwater Sampling Prior to and Following Retrieval.

(2) Ensure that appropriately located existing groundwater monitoring wells will be sampled within a two month period prior to and following the retrieval (quarterly sampling satisfies this requirement).

~~PNNL-13024, ICN 1, requires q~~Quarterly groundwater sampling is performed for the C-farm groundwater monitoring wells. In accordance with 04-TPD-083, "*Agreement on Content of Tank Waste Retrieval Work Plans*" (04-TPD-083 – letter), it was agreed to in writing by ORP, Ecology, and the tank farm contractor that quarterly groundwater sampling satisfies the TWRWP outline requirement C.1.b.(2) (this wording is in italics at the start of Section 4.1.2.2) to take groundwater samples within a 2-month period prior to and following retrieval.

Figure 4-2. Waste Management Area C and Regulated Structures.*^



* Adapted from Figure B.18 in PNNL-14548, 2004, *Hanford Site Groundwater Monitoring for Fiscal Year 2003*, Pacific Northwest National Laboratory, Richland, Washington.

^The most current list of groundwater monitoring wells can be found in DOE/RL-2009-77

4.1.3 Existing Tank Level Monitoring Equipment and Activities

Identify existing level measurement instrumentation in the subject tank and receiver tank. Identify ongoing tank level monitoring activities.

Tanks C-102, C-104, C-107, C-108 and C-112 currently have operable Enraf level gauges installed. The DST receiver tanks also have the same type of level gauge installed. Each DST receiver tank annulus has leak detection devices installed such as conductivity gauges, Enraf level gauges or similar instruments for detection of leaks from the primary tank liner.

The waste levels in tanks C-102, C-104, C-107, and C-112 while in storage mode (and C-108 when it was in storage mode) are monitored for intrusion on a quarterly basis using an ENRAF level gauge (OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection*). The basis for in-tank leak detection and intrusion monitoring is provided in RPP-9937, *Single-Shell Tank System Leak Detection and Monitoring Functions and Requirements Document.*

The primary level monitoring in the receiver DST is performed as described in OSD-T-151-00031. The annulus leak detector instruments provide indication of tank leaks as described in OSD-T-151-00031.

Level monitoring for the tank receiving the exhauster condensate, if not the SST being retrieved, will be performed as specified in the applicable Ecology approved TWRWP for that tank.

4.2 PROPOSED LEAK DETECTION MONITORING SYSTEM DESCRIPTION

This section provides a description of the leak detection and monitoring (LDM) system that will be deployed at tank s C-102, C-104, C-107, C-112, and the remaining C-108 waste retrieval operations, along with a description of how the system will be operated.

The definition of when a tank is changed from storage mode to retrieval mode is provided in OSD-T-151-00031. A tank is considered to be officially in retrieval status if one of two conditions is met: either waste has been physically removed from the tank by retrieval operations or, preparations for retrieval operations are directly responsible for rendering a primary leak detection or intrusion monitoring device out of service.

When all waste removal operations have been completed, a final waste volume measurement obtained, and all post-retrieval monitoring required by this document completed, the tank retrieval status is maintained but retrieval leak detection is complete and the tank is monitored for intrusion as specified in Section 6.~~3~~0.

percent moisture in the soil. Use of the handheld moisture gauge does not require truck access into the tank farm and is more practical for frequent use.

The RAS truck was specifically designed for routine gamma monitoring against the baseline established from the spectral gamma logging system data. The RAS uses a series of three interchangeable NaI(Tl)-based scintillation detectors for measurement over the range from background levels to about 10^5 pCi/g ^{137}Cs. The RAS records counts in specific energy ranges as well as total gamma activity. Although it does not have the energy resolution capability of the spectral gamma logging system, it is mounted on a smaller truck and collects data at a faster rate.

The RMS is a modular, portable logging unit capable of concurrent measurement of gross gamma activity and neutron moisture content. The RMS will have calibrated neutron moisture and gross (total) gamma detectors on a combined probe. It will provide dual data logs over preselected depth intervals in the drywells. The overall size and portability of the RMS will minimize interference with surface equipment, and the capability of collecting both moisture and gamma data in a single log run can result in a significant reduction in the cost of monitoring activities when compared to obtaining separate neutron and gamma logs. The RMS also provides for electronic data recording. When implemented, the RMS may be substituted for the handheld moisture gauge and may also be used in place of truck-mounted logging systems. Drywells with very high gamma activity (none of the seven around tank C-110 are in this category) may still require the use of the high rate logging system that is part of the SGLS, but it is possible that a high rate detector can be developed for the RMS. Development of the RMS is complete but as of mid 2008 it is not yet available for deployment. It is anticipated that the RMS will have a measurement range from background up to 100,000 pCi/g ^{137}Cs and 0 to 25 vol% moisture content.

The SGLS logging system was used to establish baseline conditions in 1995-2000. This logging system is based on a liquid nitrogen cooled high purity germanium detector, which provides excellent gamma energy resolution for identification and quantification of individual radionuclides from background levels (method detection limit about 0.1 pCi/g ^{137}Cs under typical conditions) up to about 10,000 pCi/g ^{137}Cs. A high rate detector with internal and external shields is available to extend the measurement range to about 10^9 pCi/g ^{137}Cs.

The SGLS truck can also be used to operate a neutron moisture logging system, which measures in situ vadose zone moisture over the range of 0 to about 25 vol% moisture content. The neutron moisture logging system uses a similar source-detector relationship as the handheld moisture gauge.

It takes about one shift of operation to obtain moisture logging data from all the drywells around a tank with the hand-held moisture probe. It takes about one shift of operation to obtain RAS data from one drywell.

The handheld moisture gauge will be deployed by qualified personnel in accordance with TO-320-022, *Operate Model 503DR M1 HP-2 or M1 HP-3 Hydroprobe Neutron Moisture ~~Detection~~Gauge* or TO-320-060, *Operate Model 503DR M1 HP-4 Hydroprobe Neutron Moisture Gauge.*

5.0 REGULATORY REQUIREMENTS IN SUPPORT OF RETRIEVAL OPERATIONS

Retrieval of waste from the C-Farm SSTs will be performed under the requirements of the Decree, *Atomic Energy Act of 1954*, RCRA, Chapter 70.105 RCW and its implementing regulations, and WAC-173-303. The SSTs do not provide secondary containment and are not compliant with RCRA and Chapter 70.105 RCW interim facility standards of Subpart J of 40 CFR 265. The SSTs are currently authorized to continue operations under Chapter 70.105 RCW pending closure in accordance with WAC 173-303-610, "Closure and Post-Closure," under the authority of the HFFACO Milestone M-45-00, "Complete Closure of all Single Shell Tanks Farms." Except as otherwise modified by HFFACO Milestone M-45-00, DOE conducts day-to-day operations of the SSTs in accordance with the interim facility standards established in WAC-173-303-400(3), "Interim Status Facility Standards." WAC 173-303-400(3) incorporates by reference the interim status performance standards set forth by the EPA in 40 CFR 265. Additionally, the SSTs are governed by federal regulations promulgated under the authority of the *Atomic Energy Act of 1954* and various DOE directives incorporated into the contract between ORP and the TOC (DE-AC27-08RV14800 for current TOC). These requirements are implemented through operating plans and procedures by the TOC.

Interim status facility standards in WAC 173-303-400(3)(a) incorporate, by reference, the interim status standards set forth by EPA in 40 CFR 265 Subpart J for tank systems. Elements of the interim status standards relevant to the WRS along with the WRS features and/or operating plans and procedures are summarized in Table 5-1.

If necessary, DOE will seek approval to retrieve waste that could contain polychlorinated biphenyls from tanks C-102, C-104, C-107, C-108, and C-112 using supernate from the receiver DST and transfer the resulting slurry to the respective receiver DST from EPA before initiating waste retrieval operations. DST supernate is classified as polychlorinated biphenyl remediation waste in accordance with Ecology et al. (2000), *Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste*. Because the DST supernate is polychlorinated biphenyl remediation waste, the retrieval of waste from SSTs, when using DST supernate, requires a Risk-Based Disposal Approval, approved by EPA, pursuant to the *Toxic Substances Control Act of 1976*.

The ventilation system(s) used during waste retrieval operations are designed to pass air through the tank, thereby reducing condensation and fog within the tank. The ventilation systems required by Washington State Department of Health include a heater, prefilter, demister, two high-efficiency particulate air filters and test sections, exhaust fan, and stack. Details of the ventilation systems are provided in ~~AIR 09-704, *Categorical Tank Farm Facility Waste Retrieval and Closure: Phase II Waste Retrieval Operations (including as amended in updates)* and DE05NWP-002R2, *Approval of Criteria and Toxics Air Emissions Notice of Construction (NOC) Application for Hanford Single-Shell Tank Waste Retrieval (as amended in updates)*~~00-05-006, *Hanford Site Air Operating Permit,* as amended and succeeded.

9.0 REFERENCES

00-05-006, *Hanford Site Air Operating Permit,* Washington State Department of Ecology, Olympia Washington, as amended and succeeded.

10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, as amended.

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.

29 CFR 1926, "Safety and Health Regulations for Construction," *Code of Federal Regulations*, as amended.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 302, "Designation, Reportable Quantities, and Notification," *Code of Federal Regulations*, as amended.

40 CFR 761, "Polychlorinated Biphenyls (PCBs). Manufacturing, Processing, Distribution, Commerce, and Use Prohibitions," *Code of Federal Regulations*, as amended.

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Atomic Energy Act of 1954, 42 USC 2011 et seq., as amended.

Consent Decree No. 08-5085-FVS, United States District Court Eastern District of Washington, October 25, 2010

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Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 2000, *Framework Agreement for Management of Polychlorinated Biphenyls (PCBs) in Hanford Tank Waste*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

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